The Journal

OF THE

BOARD OF AGRICULTURE

OF

BRITISH GUIANA.

ISSUED QUARTERLY.

VOLUME XIII.

JANUARY, 1920—OCTOBER, 1920.

26 MAY 1938

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Demerara

PRINTED BY "THE DAILY CHRONICLE," LTD., GEORGETOWN.

1921.

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AGRICULTURE 26/4/2

JOURNAL

OF THE

BOARD OF AGRICULTURE

OF

BRITISH GUIANA.

VOL. XIII. JANUARY, 1920. No. 1

TRACTORS.

As the farm tractor has already made its début in British Guiana we have reproduced in this number some notes on their manipulation, care and unkeep from the Tropical Agriculturist, the Journal of the Ceylon Agricultural Society, which bring out some salient points in connexion with these machines. Here, as in other countries, the tractor can be said to be in the experimental stage though in some districts and on some sugar estates their use is well established. There are, however, a formidable number of difficulties to be surmounted before they can be brought into general use and thus, to some extent, relieve labour difficulties in this country. On sugar estates the time honoured methods of laying out the beds of canes is a serious obstacle which debars their universal employment. The well known tenacity and composition of Demerara clay is another factor—we have ourselves witnessed with peculiar interest the inability of a well known type of American tractor to make any progress whatsoever on a local clay soil whose slippery surface gave no hold whatever to the treads of the machine despite their ridged surfaces. These are problems which are by no means unsolvable; there is little doubt that in time a tractor will be evolved which will be well adapted to the local conditions.

We foresee one further difficulty however—we refer to the Bolshevik-like methods of the local mechanics and chauffeurs from whose ranks the drivers and repairers of the future tractors will doubtless be recruited. We quote from our contemporary—"the experience in America is that with reasonable care there are little if no expenses for repairs in the first year." This would not be the universal experience in British Guiana—the 'mechanics' would see to that.

TRINIDAD COCONUTS.

The cultivation of coconuts in Trinidad is said to be the most profitable branch of agriculture, and is likely to increase in importance in the future (Board of Trade Journal, 1919, **102**, 252). In 1917 nearly 17,000,000 locally grown nuts were exported, chiefly to the United States, and over 7,000 000 lb. of copra, while about 140,000 gallons of oil were produced for local consumption. Altogether there are about 27,000 acres under coconuts in the island. The tree occurs almost all round the coast, the chief producing districts being the Cedros district with over 9,000 acres, of which 7,000 acres are bearing nuts, and the Mayaro district with 7,500 acres in bearing. The Cedros district produces about 21,000,000 nuts a year chiefly on large estates, whilst about 12,000,000 nuts are produced annually in the Mayaro district. The conditions in the latter region are less favourable and the nuts smaller than in the Cedros district There are three oil factories in the Mayaro district, producing annually about 100,000 gallons of oil and 500,000 lb. of oil cake, the latter being mostly sold as a feeding-stuff for live-stock. Coir fibre is also produced in Trinidad, though large quantities of husk are still wasted.

Great confidence in the future of coconut planting appears to exist in Trinidad, and coconut planting is being carried on by sugar and cocoa planters.

NOTES ON A COLLECTION OF PRESERVED DRY FRUITS AND SEEDS.—(*Contd.*)

By J. F. Waby.

(*Pods with Winged Seeds.*)

"West Indian Mahogany" *Swietenia Mahagonii;* "Acajou rouge," "Caoba," "Bois d'Acajou à menbles," etc.—Fruit a woody capsule 4 inches long, 2 inches wide, ovoid, dark brown, dehiscing in 5 valves from the base of the capsule, falling all to pieces. Seeds many, each in a pithy case surmounted by an oblong papery wing, together $2\frac{1}{4}$ inches long. A high tree with pinnate foliage of several ovate leaflets 2 inches long. Inflorescence in axillary panicles, flowers small. This tree supplies the mahogany timber so much used for furniture making. Specimens Botanic Gardens

"Honduras Mahogany," *Swietenia Macrophylla.* Everything about this tree is similar to the West Indian Mahogany but in every particular much larger, size of tree, of fruit and foliage. Capsule 6 inches long, $3\frac{1}{2}$ inches diamater, dehiscing in 5 valves from the base with winged seeds. Foliage pinnate with 4 pairs of leaflets. Specimens from Botanic Gardens, the first produced there.

Pterospermum acerifolium, from the East Indies Capsule oblong, rounded, covered with a soft brown tomentum, $3\frac{1}{2}$ inches long, $2\frac{1}{4}$ inches diameter, dehiscing in 4 thick, triangular valves from the apex joined at the base, differing from the dehiscence of the Mahogany which is from the base and breaks to pieces. Seeds many, small with wings an inch long, lying flat, closely packed in the grooves at the valves. A fairly large tree with large peltate, acer-like leaves, whitish beneath, 13 inches by 10 inches, many much larger. In the growth of young trees they are smaller with long lobes. Inflorescence axillary. Flowers large, with 5 thick, russet coloured sepals and a white, spreading, tubular corolla, splitting into 5 segments. Specimens from Botanic Gardens.

Other pods:—The "Crab-nut," "Carapa," "Carbaballi." "Coond-oil tree," etc—*Carapa guianensis*, indigenous. The fruit a capsule, 3-3½ inches long, 2-2½ inches square, with prominent ribs at the corners, an obtuse point, dark brown, dehiscing in 4 thick woody valves midway between the corners. Seeds large, angular, smooth, dark brown, 10-12 in each capsule, nut-like. Foliage large, pinnate, 18 inches long with 7 pairs of leaflets, elliptical, pointed, 6 inches long, 2-2½ inches wide. Inflorescence in large terminal panicles; flowers small, yellow. A large timber tree supplying "Crab-wood" which is used for building purposes. The seeds contain a quantity of oil which is expressed to make "Crab-oil," used for soap making, and largely as an emolient by Creoles and Indians. Specimens from Botanic Gardens.

The "West Indian Cedar," *Cedrela odorata*. The fruit a capsule 1½ inches long, ¾ inch diameter, brown, speckled with grey, dehiscing in 5 valves from the apex, hanging like small bells in grape-like clusters. Seeds small, winged, lying on a central scolloped column, 5 cornered. Inflorescence in terminal pendant panicles a foot long; flowers, small green odoriferous. Foliage pinnate, on young vigorous trees with 16-17 pairs of leaflets, on flowering and fruiting trees these are reduced to about 10 pairs; unequal sided, pointed, pairs graduated from 5-7 inches long, and 1½-2½ inches wide. A tall, straight, grey-stemmed, pyramidal, deciduous tree which supplies the ordinary Cedar-wood of commerce. Specimens from Botanic Gardens.

Cochlospermum Gossypium, from the East Indies. The fruit an egg-shaped capsule, 2¾ inches long, 1⅝ inches diameter, brown, dehiscing in 5 valves, each valve with a stiff cream-coloured replum. A second casing inside, dehiscing at the same time, parchment-like, cream-coloured. Numerous small moon-shaped seeds, each enveloped in a coma of fine white silky material. A calyx of 5 oblong sepals with the dried stamens adhering between it and the fruit. Foliage palmate, of 5 lobes, serrate, pointed, 4½ inches long, 6½ inches wide, thin, veins prominent beneath. Inflorescence a terminal panicle.

Flowers large, bright yellow, salver shaped, 3 inches across. Stamens innumerable, orange coloured, clustered in the centre; 5 large petals, a calyx of 5 sepals—2 green and brown, 3 greenish yellow, the 2 much smaller than the 3. A shrub or small tree, deciduous, flowered whilst bare of leaves.

The "Sea-Egg" fruit, *Apeiba aspera*, of the West Indies. The fruit an eclimate capsule, 2½ inches diameter including the spines, these ½ inch long, 2 inches thick, pale brown, opening in 6-8 compartments. Seeds small, black. Foliage oblong 9-11 inches long, 4-5 inches wide, serrate, hirsute beneath. Inflorescence on short lateral branches. A small tree with drab-coloured bark, deciduous, branches ascending; when in fruit the tree is destitute of foliage, the capsules alone remaining. Specimens, Trinidad.

The "Blistering tree," "Manchioneal," *Hivv omam man cinella*, West Indian, Skeleton of fruit only. This is a wonderful object, quite worth recording as a curio and difficult to describe. Cleaned of all extraneous matter, it is like a bit of carved wood, an inch high and wide, with short pinacles all round the middle, raising in the centre with flat divisions to a point, will divide into 4 sections disclosing the apple-pip-like seeds in its compartments. Very few people indeed have noticed these curious objects or know what they belong to. The fruit is a small round apple, 1¼ inches in diameter, pale green, smelling like "Crab Apples," covered with a thin skin, the interstices of the skeleton filled in with thick, soft material which dries to fecula. When the skin of the fruit has decayed it shows the naked fruit marked in 8 sections, filled in with the thick mealy substance, this being picked out gives the curious carved skeleton. A large spreading tree where it has room to grow in a sheltered position, but in Barbados where it is usually seen in a wind-swept position, it is by no means a handsome tree, but scrubby and wind-torn. Foliage simple, ovate, 3 inches by 1¾, pointed, dark green above pale beneath. The inflorescence is monœcious; male flowers very small on short terminal spikes; female flowers

solitary, axillary. The tree must be guardedly dealt with because the foliage on being touched causes a stinging sensation, and often blistering, on any exposed part of one's body. It was introduced by myself from Barbados to Demerara some 25 years since. Some good specimen trees are in the Botanic Gardens.

The "Arjun Nut" fruit of *Terminalia Arjuna*, "Beef tree" an East Indian tree. The fruit an indehiscent, corrugated capsule, 2½ inches long, 1¼ inches wide, with 5 or 6 short, stiff, scaly wings, dark brown. Inflorescence a large terminal panicle with small whitish flowers. Foliage in pairs, ovate-lanceolate, 8 inches long, 2¼ inches wide, pointed, dark green above. pale beneath, midrib prominent. A tall tree with brown scaly bark and long drooping branches with little spread. Specimens, Botanic Gardens.

Barringtonia speciosa, from India. The fruit a large fibrous capsule, indehiscent, 4 square, 3½ inches wide, 4½ inches high, surmounted by 2 cupped sepals, 1¼ inches wide and high, and the persistent pistil 5 inches long; 4 sharp corners turning underneath and forming arches below, mounting to an abrupt point above; green on the tree, turning brown when dry. When the thick fibrous material is stripped off, these show seeds superimposed, 1½ inches in diameter, solid, brown, flat where they meet each other. A large imposing tree Foliage 12-15 inches long, 6-7½ inches wide, broadly spathulate, emarginate, dark shining green above, glabrous beneath. Midrib and veins prominent. Inflorescence a terminal raceme with a few large white flowers, nocturnal, opening generally one at a time. Flower stalk stout, 3 inches long, a persistent calyx of 2 large, green, cupped sepals; 4 white, oblong petals 3 inches long, 1½ inches wide; stamens innumerable, polydelphous, white, 3-3½ inches long; the pistil 4½ inches long. A very conspicuous flower but falling early. Specimens from Botanic Gardens.

The "Violet Vine," *Corynostylis Hybanthus*, indigenous. Fruit a conical capsule, 2 inches by 1½ hard, woody, splitting into 3 valves, dark grey. Seeds innumerable, packed

close together, fat, red, $1\frac{1}{2}$ inch to $\frac{1}{8}$ inch, cuneate, woody. Inflorescence a terminal panicle, flowers small, white, flower fully scented. Foliage elliptical in pairs, 5-6 inches long, $2\frac{1}{2}$ inches wide, veins prominent. A strong climber. Specimens from Botanic Gardens.

Allamanda. Fruit a prickly capsule dehiscing in 2 valves, the seeds lying flat on each other closely packed, looking like flat lozenges, $\frac{3}{4}$-1 inch in diameter. The size of the capsule varies with the different species of which there are several. The largest capsule is borne by *A. Schottii*, of Brazil which is indeed the best of all the Allamandas,—measuring at least 3 inches across, and 2 inches thick including the spines, which vary from $\frac{1}{4}$-$\frac{5}{8}$ inch long each with a spreading base. The fruits of all the species are of the same pattern differing only in size. The inflorescence is an axillary raceme on the young growth, the flowers campanulate with long or short tubes according to the species, all yellow, some darker than others, some with a deep golden throat as with *A. Schottii* which flower is 6 inches across the expanded corolla. The foliage varies in shape with the different species, all are of a dark shining green above and pallid beneath, oblong, lanceolate, $3\frac{1}{2}$-5 inches long $\frac{1}{2}$-2 inches wide some simulate; one species *A. Aubletii* quite narrow. In all the species the leaves are in whorls of 4 or 5 from 2-$3\frac{1}{2}$ inches apart. All are strong, scandent plants except *A. nereifolia* which has capsules only about an inch in diameter. A small shrub with deep orange coloured flowers much smaller than those of the other species.

"Goodluck Seeds" *Thevetia nereifolia* of South America. Fruit a succulent, pithy, indehiscent, one seeded capsule, square or angular, ridge-pointed, $1\frac{1}{2}$ inches each way, sutures at right angles with the ridge, decaying easily to liberate the seed. The seed hard, brown, of all sizes from $\frac{1}{2}$ inch to $1\frac{3}{4}$ inches long, $\frac{1}{4}$-$\frac{3}{4}$ inch wide, and $\frac{3}{4}$ deep rhomboidal or triangular, boat shaped, ridged around the middle, split on the upper straight surface. Inflorescence an axillary raceme; flowers large, tubular, volute, $2\frac{1}{2}$ inches long, spreading $1\frac{1}{2}$ inches, yellow, the edges of the volute corolla coming up pale green from the base. A calyx

of 5 green sepals, prominent. Foliage, linear-lanceolate, 5½ 6 inches long, ¼ inch wide, dark green above, glaucous beneath, very closely set on the branches. A large shrub or small tree filled with a milky sap. The seeds called "Good-luck Seeds", often seen carried on watch-chains and otherwise mounted as ornaments. Specimens Botanic Gardens

The "Candle-nut" "Belgaun" Walnut" "Indian Walnut" "Molucca nut," "Otaheite Walnut" "Noix Chandelles" "Noix de Bancoul," "Banconlier," "Akroot," etc.; *Aleurites triloba*, of India. The fruit is a succulent capsule like a green apple with a blunt point, tomentose, 1½-2 inches in diameter according to the number of seeds it contains, these being 1-4 the succulent case easily decaying. The seeds are enveloped in a tense parchment-like case which breaks easily. Seeds very hard, brown, something like a Walnut with dents and furrows 1 inch long and wide, ¾ inch thick, the substance nut-like and of agreeable flavour. Inflorescence in short terminal panicles; flowers small white, perfumed. In young trees the foliage is ovate-pointed, 7 inches by 4 inches, tomentose, 2 glands at the base, in old trees the foliage assumes a triangular form with decided lobes. In the trilobed form the leaves are 6-7 inches long, 5-6 inches across the lobes, with 3 main ribs. A medium sized tree. Specimens from Botanic Gardens.

The "Sand-box" fruit, *Hura Crepitans* of the West Indies. The fruit a hard, circular, corrugated, depressed capsule 3 inches wide, 1½ inches thick, in one-seeded moon-shaped segments, constricted between the segments which are as many as 15. A central portion of rays, an inch wide, leading from the apex of the stalk to between the segments on the surface. A thin outer skin over all. In dehiscing the whole fruit bursts asunder with a loud report in segments, the segments dehiscing, at the same time ejecting the seeds The seeds, circular, thin, like brown buttons ¾ inch wide, of very strong purgative properties, if not actually poisonous. The inflorescence is monoecious on separate branches; the female tubular with a funnell-like mouth, of a dark reddish colour, the male flowers are red, very tiny, in miniature banana-like bunches. Foliage, cordate, acum-

inate 5 inches long 3 inches wide, veins prominent in pairs. A large forest tree with thorny bark. The fruits are frequently seen as letter weights being filledwith lead.

"Tiger Cacao," "Hard-shell Cacao," *Theobroma bicolor*, of New Grenada, Fruit 5-6 inches long, 4-4½ inches diameter, hard, woody, 6 strong upraised ribs running from end to end, with intermediate ribs branching half way, veins all over between the ribs with deep pits. Foliage dark green above pale grey beneath, ovate, pointed, 9 inches long, 4½ inches wide, veins prominent beneath, 5 ribs starting from the petiole. A tall tree with drooping branches. The fruit ranging from the points. Specimen from Suddie.

"Calabash" fruits. *Crescentia Cujete*, is the common Calabash tree of the West Indies, met with in various forms of fruit, round, oblong, conical, of various sizes from a few inches in diameter to 7 or 8 inches, and from 3 or 4 to 12 or more inches long: a very large form grows on the West Coast of Berbice, capable of containing 2-3 gallons of water, there it is used as buckets for the transport of water by the poor people. The inflorescence is borne on the stems and branches, (cauline and ramose) sessile, solitary, campanulate, 2 inches long and wide, lower part slightly rosy, upper part pale green, with dark brown makings, yellow inside, corolla points dark grey, 2 calyx lobes pale green an inch across; pistil and stamens pale yellow. Foliage in sessile groups, varying in shape on different plants, some spathulate 5-7 inches long, 2-1½ inches wide, some lanceolate 4-5½ inches long, 1-1½ inches wide, others lanceolate—cuneate 8-9 inches long, 1-1½ inches wide. A small, low, branching tree.

Crescentia cuneifolia, a variety of *C. Cujete*. Fruit obovate sides slightly flattened, 4 inches long, 2¼ thick, 3 inches wide, with a small point. Inflorescence cauline and ramose, flowers solitary, campanulate, 2 inches long, 1½ inches wide, upper part brown with darker stripes, base green; 2 calyx lobes pinkish, ⅝ inch long, pistil red, stamens and anthers cream coloured.

Foliage in fascicles all the way up the stem and along the branches. Several leaves spathulate 3 inches long, about 3 leaves linear 3-5 inches long; others cuneate 1½ inches by one inch, several at the base of the group 1½ inches by ⅜ inch, some with 1—2—3 joints, quite a combination of forms in the same group. A small tree or large shrub with straightish branches 2-3 inches in diameter,

Crescentia cucurbitina. West Indian Fruit, small, rounded with 4 smooth corners, pointed, 3 inches long, 2 inches wide. Inflorescence terminal, solitary, campanulate 2 inches long, purplish, 2 calyx lobes an inch across. Foliage elliptical, leathery, dark shining green, 7 inches long, 3½ inches wide, many smaller. A dense growing small tree. Specimens of all the Calabashes from Botanic Gardens.

The "Bael fruit," "Bela," "Bela Maredoo," "Bhäl or Bhel fruit," "Bengal quince," "Elephant apple," etc, *Aegle Marmelos* of India, a calabash-like fruit. Fruit spheroidal, 4½ inches long 3½ inches wide, some larger, some smaller. Inflorescence terminal on short branchlets, fascicled ; flowers like orange-blossoms greenish, white, strongly perfumed, Foliage trifoliolate, 2 lower leaflets 2½-3 inches long, 1½-1⅜ inches wide, upper leaflets 4½ inches long, 2½ inches wide, ovate, crenulate. A small deciduous tree with white spongy bark, well clothed with branches which spread little. The pulpy substance contained in the fruit said to be largely used in India in cases of dysentery. Specimens from Botanic Gardens. I do not think it is generally known that there are two forms of this fruit. The second form is exceedingly rare. I have met with but one tree of it. This second form instead of being conical or spheroidal is rounded with a decided depression top and bottom, looking much like a "Grape fruit", It is of various sizes, the largest being 4½ inches across, and 3¼ inches thick. Specimens Trinidad. Other hard shell fruits:—

The large "Monkey pot," "Marmite de Singe," "Sapucaia-Nut," "Canari-Macaca," "Wadaduri", etc. *Lecythis grandflora*, of S. America. Shell of the fruit

very hard and woody, 7-8 inches across the widest part, 6 inches deep, more or less circular, sloping from the middle downwards to the stalk, and upwards to the orifice 2 inches across, caused by the fall of the lid by circumscissile dehiscence (the lid not often to be obtained) as the fruit is heavy it hangs down naturally and the seeds fall out. The seeds of the Sapucaia-nut from Brazil, if not identical, are very similar to those belonging to this fruit; they are 2-3 inches long, an inch diameter in the middle, bluntly tapering both ends, with several ridges, a thin brown skin, and the substance is white of a most delicate nut flavour.

"The small "Monkey-Pot" of Trinidad, *Carinsana exigua*. The fruit pearshaped, 3 inches long, 2 inches across the widest part around which is a slight ridge, dark brown; an orifice at the apex $1\frac{1}{4}$ inches wide, caused by the fall of the lid of the fruit, which is a veritable "stopper," like a large thick nail going down into the centre of the fruit, having 3 deep grooves on the stem in which winged seeds have been packed. The lid falls off by circumscissal dehiscence releasing the seeds. A large deciduous tree with long slender branches, foliage oblong, 2—3 inches long, $1\frac{1}{4}$ inches wide. Inflorescence terminal in large, loose, pendant panicles, showing quite white all over the ends of the branches; flowers small, white, $\frac{1}{2}$ inch diameter, fragrant, 6 linear petals, the centre arched over like that of all the Lecystudeae. Specimens Trinidad.

The "Monkey Pipe," "Guatecare," "Water-case," *Lecythis Idatimon* of Brazil. The fruit of various sizes up to $1\frac{1}{2}$ inches long and wide, rounded, the top half falls off by circumscissal dehiscence in a solid lid, leaving the lower half on the tree, a veritable cup; half way down the outside of the cup are 6 tract-like protruberances in a circle. The seed—the top of which is solid, falls like a lid, in which 1, 2, or 3 nut-like seeds are embedded, these fall together and separate on the ground. Inflorescence in terminal panicles. The flowers cream coloured about an inch in diameter, similar to all flowers of the Monkey-pot family, shaped like a half-closed hand, the stamens hanging directly over the pistil. Foliage thick, leathery, entire,

dark green, 7-9 inches long, 3-4 inches wide. A medium sized tree with more or less pendant branches, Specimens from Trinidad.

The "Monkey Cup," *Couratari guianensis,* an indigenous tree. Fruit cases only. Tree not seen. These are veritable cups, like narrow straight-epergnes, woody, thin, 6-7 inches long, 1½ inches wide, with a full sized orifice at the apex from which the lid has dropped by circumscissal dehiscence. The lid is flat with a long furrowed stem which goes down into the fruit, on the sides of which the winged seeds are attached. The seeds like those of the small monkey-pot fall out as soon as released by the fall of the lid. Specimens brought in from the Interior.

The "Brazil Nut" *Bertholetia excelsa,* of S. America and Guiana, the seeds known also as, "Cream Nut," "Para Nut," "Nigger-toe," "Castanheiro," etc.—The 3 cornered, hard shelled seeds, (nuts), are so well known universally that there is no need to describe them, but the fruits in which they are found are very little known, and visitors to the tropics and even persons living in the tropics are very much surprised to find how they are obtained. As with most fruits they vary in size, and the number of seeds contained vary also with the size of the fruits, from 8 to 20 seeds. The fruit is a large brown capsule, like a fair sized cannon-ball, of rather rough exterior, There is a small hole at the apex and a "stopner" which falls inside the fruit. The substance of the shell is exceedingly hard requiring great force to break it or a saw to cut it through. Infloresence a terminal panicle. Flowers cream coloured, 1½ inches across, composed of six wavy petals turned outwards and a "ball" in the centre containing the staminal organs which turn completely over the centre of the flower. Foliage large, 12-17 inches long, 4-5½ inches wide, oblong, wavy, cross ribs regular and very plain. A large deciduous forest tree. Specimens. Trinidad. In the ordinary course of nature only one seed contained in the fruit can succeed; the case is so very hard that a long time must elapse before it can de-

cay, with the moisture from rains in the forest the seeds all germinate and the first to reach the small hole in the fruit can continue its growth, all the rest must die of suffocation.

The Strychnine fruit and seeds. *Strychnos Nux-Vomica*, of India and Burma. The fruit like a small round smooth apple 1½-2 inches diameter, yellow when ripe, with a hard, thin skin, indehiscent. The seeds button—like, ·5-8-¾ inch in diameter, looking as if covered with satin plush, in the fruit—lying in a pulpy sticky mass. Inflorescence a very small terminal panicle of small greenish flowers. Foliage in pairs, ovate, pointed 4¾-5 inches long, 3 inches wide, with 3 longitudinal ribs, dark green. A small little branched tree. Specimens from Botanic Gardens.

Smaller Capsules, etc.— "Incense tree," "Hyawa Gum-tree. *Protium* (*Icica*,) *heptaphyllani*, of Guiana and Trinidad. The fruit in bunches of green capsules, single, double, and treble according to the number of seeds contained, turning reddish on ripening, dehiscing as soon as ripe and falling to pieces by valves, each valve concave, short, boat-shape, containing one seed, The single fruits are ¾ inch long, ⅝ inch wide. The double ones an inch across and the treble fruits triangular an inch across each way. On opening, the inside of the valves is of a crimson colour, containing a small mass of whity pulp encasing the seeds, strongly impregnated with the incense perfume. The seeds are like ordinary dark brown beans, the inner side as if the skin had been removed. To preserve the fruit it must be taken just as it becomes "full" before ripening, as then it breaks to pieces. Inflorescence a terminal panicle with branches 2-3 inches long, crowded with tiny greenish flowers in fascicles. Foliage pinnate, 12-14 inches long, in 5-½ pairs generally, leaflets elliptical, pointed, dark green, 4-4½ inches long, 1½-1¾ inches wide with short petioles, veins plain in regular pairs or nearly so. A medium sized tree with strong branches and dense foliage. Incense is obtained from the base of the

tree from which it oozes, often being dug out of the earth or sand close to the stem; also can be obtained by bleeding. Specimens from Trinidad.

BUD ROT.

By J. S. Nedd, L.R.C.P. & S. etc. (Edin.)
M.D.C.M., F.T.M.C. (Canada).

(Although we are not in entire agreement with some of the theories set forth by our contributor in this article we reproduce it as containing much wholesome advice from one who has had considerable experience in planting coconuts.—Editor.)

Much has been said and written for years on this disease so dreaded by coconut planters all over the world, with apparently no good results as the disease continues to make itself felt as time goes on; to my mind no worse to-day than it was fifty or one hundred years ago. There was a time when it passed unnoticed and unnamed; when the coconut was of very little commercial value, consequently those who cultivated the palm seriously were few and far between. Within recent years, however, through an insufficiency of animal fats, vegetable fats have had to be resorted to, the coconut proving one of the best suppliers, it naturally received the honoured and respected position in which it finds itself to-day "a well cared and nurtured child, one of the hopes and expectations of British Guiana and the world." But, alas! "Bud Rot" presents a most formidable problem not easily solved. It threatens to keep the coconut palm within its already too narrow limitations.

In nearly every coconut cultivation in the colony there is evidence of this dreaded disease in greater or lesser degree. In some places, the number of trees affected are negligible, in others, one might well term

it an epidemic. Thus far, all the remedies recommended have had no effect in retarding the progress of the disease. As soon as it is seen that a tree is infected, despite all efforts, it dies; it is cut down, in some cases burnt and disinfected but unfortunately the disease spreads.

How does it spread? It does not necessarily do so by contact nor does it travel in the prevalent direction of the wind. Very often a tree is affected and in any part of the cultivation, it dies; nothing is done to it; no precautionary measures are taken. In some cases the disease spreads to a greater or lesser extent, in others it behaves as if it never existed; and again in others every precautionary measure is taken, but the result remains the same. On every plantation or grove affected, it will be noticed that the line of infection is very irregular; that is to say, the disease might manifest itself in any locality, and attack trees to some extent all over the plantation; not necessarily attacking those nearest the first affected, nor does it necessarily travel in the direction of the prevalent wind.

There is yet another peculiarity manifested by the disease. It apparently does not exist in some places, in others it does in an endemic form, manifesting itself sporadically; yet in other localities, it is what one might call an epidemic plague.

The trees affected are generally from five years of age up. The height of the ravage is generally most when the plant attains its full commercial value,—from ten to fifteen years. Thus it might be seen in plantations where the disease is epidemic, the trees in full bearing are cut down and destroyed one after another; whereas younger trees from a year old to the first bearing (about five years,) are in their best health and condition. The disease passes them unnoticed, they seem to enjoy an immunity. It is a common experience that the trees die as soon as they start to bear properly, that is when they attain the commercial age.

From the above, one is irresistibly forced to the conclusion that the disease does not obey the laws of

contagion and infection. There is no evidence that it is carried by the wind or anything else.

As a rule, a disease is generally recognised by its behaviour, and that behaviour is in conformity with certain laws which render it amenable to treatment.

Thus far "Bud Rot" knows no law, and is amenable to no treatment. Why? Because the title "Bud Rot" is a misnomer. I am of opinion that the name is so frightfully misleading, that it misdirected the investigation at its very inception. There is no such thing as "Bud Rot." As a matter of fact though the spire is the most sensitive part ot the plant, it is the very last to show signs of impending death.

Let me state here once for all that it is useless to attempt to save a tree if it shows signs of infection; no tree has ever been saved, nor is it possible to save one after the infection is appreciated, even in the slightest degree; for the simple reason that one of the most vital organs of the plant was not only attacked, but dead over six months before outward appearances manifested themselves, and the plant undergoing molecular death, starting from the periphery or the oldest or most distant limb, life being only prolonged by means of auxiliary vital organs.

The lowest or oldest limb is the first to show a diseased state. If it were a germ infection, how did the germ get to that limb? And why should it attack the oldest limb first?

It must be admitted that if it travels from below, it might attack the lowest limb first, but cannot invariably do so, for the simple reason that the limbs grow in a whorl, the distance between the first, second and third lowest limbs is infinitesimal. As a matter of fact, they touch at the point of attachment to the tree. Is it possible that germs will attack with such uniformity and regularity the lowest limb when the relationship between it and the two other limbs is so close? Such is not the behaviour of germ invasion. If by the wind, why should this lower limb be invariably selected for attack?

Why should the young plants demonstrate such an immunity when it is an admitted fact that they are the

first to suffer in germ invasions of any kind? We find, however, that the young plants enjoy an undoubted immunity.

In a sense the attacked limb behaves in a natural manner, that is to say, in a healthy tree, the matured limb separates itself from the trunk and falls to the ground. The cause of this is due to the developed fibrous condition of the attachment between the limb and the trunk which results in the occlusion of the veins supplying nutrition to the limb. In the condition known as "Bud Rot," practically the same thing happens. The affected limb separates itself from the trunk, from want of nutrition; the other limbs sharing the same fate, in perfect order and rotation.

In order to better understand the subject, we must study somewhat the habit of the plant.

Like all plants, the coconut requires certain conditions for its growth and development; and unless these conditions are present from the very beginning of its life, sooner or later disaster overtakes it.

The nature of the plant is such, that full and complete preparation should be made before it is put into the soil—that is to say, no preparation work should be in progress whilst the plant is trying to establish itself.

Every permanent erection must have a substantial foundation to support the superstructure—the same is true of plants, the coconut being a very long liver under favourable conditions, demands great care and thought for its successful cultivation.

The essentials are :—

a. Air and food constituents.
b. Light.
c. Drainage and Sanitation.
d. Soil and food constituents.

It is hardly necessary to say much with regard to *a* and *b*, suffice it to say that the trees must not be overcrowded, they should be from 30 to 36 feet apart; no other, or very few fruit trees should be planted between them and the cultivation should not be hemmed in by a

belt of trees. In other words, the trees should enjoy no other shelter nor shade than that provided by themselves.

Drainage, sanitation, soil and food consituents.—Perfect drainage is absolutely necessary; it must be sufficient and of good quality. The cultivation must be neither over-drained nor under-drained. A maximum and minimum water level should be maintained and that must not be absolutely dependent on weather conditions. That is to say, it must be regulated if possible to a nicety. In other words, during the wet season the water level should not attain more than the maximum, and must be kept there; when the dry season sets in evaporation will reduce it to the necessary minimum. Of course, where there is a regular irrigation scheme, water will be supplied and taken off as required, by thus regulating the water level, the sub-soil water remains sweet, and the soil is kept ventilated; there is a free admixture of gas, water and soil and of the right quality and quantity.

The above is absolutely necessary for the proper nutrition of the plant from the soil.

The coconut puts out two kinds of roots:—

a. The surface or stay roots.

b. The deep or feed roots.

The surface roots, as the name implies, are seen on and a little below the surface, they stay and support the plant in its growth; and in a small measure convey nourishment. In that way when manure of any kind is placed around the tree the plant is benefited; manure thus placed does not get beyond the surface roots which are so compact, that there is no passage for it to descend. Of course such manure supplements the food supply, conserves the natural manure, and relieves the feeders of extra work,

The deep or feed roots penetrate deeply into the soil for food and moisture. There, under favourable conditions, it finds them in a suitable state for absorption and assimilation.

Through the admixture of sweet water, air, phosphates, nitrogen, lime and potash, a compound is formed containing all the constituents for the nutrition of the plant. This is absorbed by the deep roots and put into circulation.

On the other hand, when the drainage is bad and indifferent, the subsoil water is sour and polluted, the gas is foul, the various salts remain undissolved or emit a poisonous gas: the feeders become asphyxiated and die. The death starting from the end and spreading upwards; the shorter roots in turn become infected, thus leaving the surface roots to do all the work, and work they were never intended to do, nor prepared for without the necessary material, that is, the food elements.

From want of nourishment the tree dies from molecular disintegration, that is to say, the part that is most distant shows signs of death. The most matured limb is the first to indicate the plant is dead. The youngest and most tender parts of the plant attacked are the last to be invaded; whilst the lowest limb which is most fibrous and with a greater power of resistance is the first to show signs of impending death. It is clear that the behaviour of this condition demonstrates no relationship with any other condition—the result of germ invasion; on the contrary it points to something else.

The plant starts to bear roughly speaking when it is five years of age, and attains it's full commercial value at ten and after. This is the period when most food is required and when the feeders are prolific and active. It is at this time that they dip their noses to drink slow, long and deep; but alas!—instead of Nectar, it is vinegar and gall.

We name the cause of death "Bud Rot"; call it by any name, I have stated the cause. It is a preventable disease, and the remedy is at the disposal of all.

I might have stated that even altitudes far higher than British Guiana, where natural drainage prevails, stagnant subsoil water exists and must be dealt with in a manner suited to the locality. In short, "Bud Rot" is due to the following causes;-

a. Bad drainage.
b. Want of proper soil-food.
c. The formation of poisonous gas or gasses.

THE HEALTH PROBLEM IN BRITISH GUIANA.

By E. P. Minett, M.D., D.P.H., D.T.M. and H.
Government Medical Officer of Health of the Colony.

The problem of sanitation in British Guiana is much the same as anywhere else in the world, that is, it resolves itself into a few essentials; money, of course, is all-important, as it is in all Sanitary schemes. Then come the usual headings: Drainage, Water, Sewage.

Let us briefly discuss these four points as they affect the Colony.

1. Drainage.

In a low-lying country, with a heavy, non-porous soil and a heavy rainfall, this is all-important.

The large Sugar Estates and the City of Georgetown are well drained by the "Koker" or "Sluice" system. This briefly consists of opening the Kokers at low tide and allowing the surplus surface water to run out to sea. The Kokers, of course, being closed at high tide to prevent the entry of sea water. The system works well in cases where attention is paid to the kokers and grading of the drainage trenches, such as the Sugar Estates and Georgetown; but in the villages it is a failure, resulting in many villages being flooded out for a large portion of the year. The Local Government Board Ordinance provides for self government in these villages, but the people do not appear to be capable of handling the drainage problem of their own villages. The causes of the failure are numerous and have been the subject of much discussion. Money is at the bottom of the trouble as usual. The trouble being to find the money necessary to keep the trenches dug and the kokers in repair. The villagers complain that they are unable to provide the money or labour to drain their own villages. Whether this is due to real poverty and inability to pay the necessary rates or due to indifference and unwillingness to shoulder their own burden of responsibility is a much discussed question and one that

is hardly within the province of a Health Officer to discuss. The main facts are that the work is not done and consequently the health of these villages is seriously affected.

The question of drainage is undoubtedly one that should be taken up by the Government without delay, as until this problem is solved no system of sanitation can have even an outside chance of success. Our present high mortality from mosquito-borne and intestinal diseases is intimately bound up with the deplorable condition of the drainage system of the coast villages and coast lands generally. The first essential to an improvement in general health conditions, in a Colony situated as this is, lies in the provision of efficient drainage system kept always in a high state of perfection at all costs. The question is " who pays the piper."?

2. *Water Supplies.*

In British Guiana the trouble is not that we cannot obtain water but that we have too much of it.

The possibilities are as follows :—

(*a*) *Artesian Wells* have been sunk in various parts of the Colony, but in most cases have proved a failure owing to the choking of the pipes with fine sand in most cases after the water the bearing strata was tapped. The water obtained from the few successful wells is of exceptionally good quality and only requires very simple treatment to rid it of the dissolved iron to produce a really first class water. The expense of collection, storage and stand pipe delivery of this water should not be beyond the means of the villages concerned. If the engineering difficulties could be overcome, a good water supply would be assured. At present they are not, so that other supplies must be discussed.

(*b*) *Shallow Well Water.* This water varies very much in composition. In many parts of the Colony it is very brackish and in addition contains a large amount of dissolved iron, rendering it unfit for domestic use. But in some parts of the Colony, such as the sand reefs in

Essequebo, a very good and potable water can be obtained at a depth of a few feet only.

These supplies are capable of being developed and providing a good water supply at small cost in the districts where this water is easily obtainable. The cost of a small petrol engine for pumping, with provision of storage tanks and delivery pipes should not be beyond the means of the larger villages concerned. But the supply is only available in certain restricted areas of the Colony.

(c) *Rain Water.* The rainfall in British Guiana is a very heavy one, averaging nearly 100 inches per annum, so that the question of an adequate supply does not apply. A simple calculation of the amount of water falling on even a few square feet of catchment area per annum will prove this. It is merely a question of collection, storage and distribution. Here again we are up against the same old problem—*no money!* Regarding rain water as a source of supply, I am of opinion that the cost of providing the necessary catchment areas and storage tanks would be prohibitive. Otherwise, the purification of the stored water by means of chlorine and its subsequent delivery to stand pipes is easily carried out. It resolves itself into a matter of first cost of collection.

(d) *River and Savannah Water.* This water forms the bulk of the water supplies on Sugar Estates and in Villages. It consists of a brown soft water containing over 4 grains of organic peaty matter to the gallon. The organic colouring matter is easily removed by the addition of a small quantity of a soluble aluminium salt, such as alum or aluminium sulphate, and subsequent sedimentation. The resulting water is of very good class and suitable for domestic purposes. If chlorinated after sedimentation it provides a first class drinking water of a high degree of purity. *B. Coli* being absent from 10 c.c. I am of opinion that sedimentation tanks, where the water could be clarified and subsequently chlorinated before distribution to stand pipes, are well within the means of most Estates and Villages.

3. *Sewage Disposal.*

An up to date scheme of sewage disposal by means of Ejectors and subsequent delivery of the sewage at sea is at present under consideration for the City of Georgetown. At present the sewage is dealt with by means of open cesspits emptied by motor Excavator and subsequent dumping into the mouth of the river. Most Government buildings and many of the larger private houses are provided with septic tanks and filter beds, the resulting effluent being discharged into the open concrete gutters of the city. A small area of the city is provided with the pail system of sewage disposal. On sugar estates the system of sewage disposal is to place latrines over the open drainage trenches. Where a large volume of water is available and the trench is flushed out daily direct into the sea, this system is fairly satisfactory, but in cases where the trenches are small, shallow and inadequately flushed it leaves much to be desired especially as regards the spread of Ankylostomiasis and intestinal diseases generally. In villages where good drainage is possible, the surface water quickly disposed of and the sub-soil water kept at a moderately low level the pit latrine has proved a success; especially where the latrines are regularly treated with crude Petroleum Oil no nuisance results.

In cases where this latrine has proved a failure it has either been because the villages are liable to constant flooding or to the fact that the latrines are destroyed by pigs digging under them to get at the contents of the pits.

The pig nuisance is one that can be controlled by the villages themselves, but the flooding of the villages is dependent on a solution of the drainage problem.

Most of the houses of the Planters and Overseers in the country districts are provided with the septic tank system. Estates' Hospitals are now also largely supplied with a septic tank system. Up to the present this system has proved an unqualified success and has given no trouble whatever after being once installed, provided the flushing arrangements are adequate.

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To sum up, the key to a successful Sanitary campaign in this Colony is Drainage.—*West Indian Committee Circular.*

THE WITHER-TIP OF LIMES.

During July and August, 1918, there was a severe outbreak of a disease of lime trees throughout the colony, practically all districts being equally affected. Specimens were received from a large number of different estates and all showed "wither tip" in its characteristic form. This is one of the commonest and most destructive diseases of limes, though hereto, it has not been very prevalent in Trinidad. It is due to the fungus known as *Gloesporium limetticolnm*, Clausen. The fungus is able to attack the young growth of lime plants of all ages; in fact at the St. Clair Experiment Station it has caused the death of a great many nursery plants of from six inches to a foot high, during the past two years.

Appearance of the Disease.

The attacks of the fungus generally show on the tips and edges of the very young leaves but they affect also the leaf stalk, at the point where tho leaf joins the stem, or any point in the very young shoots. The first sign of infection is indicated by a somwhat water-soaked appearance until the young leaves and tip of the shoots are entirely destroyed. If the weather is not so damp, the water-soaked appearance is not so pronounced, but the attacked part is light green in colour at first, and then becomes brown. In all cases, the affected shoots wither up, thus giving the popular name of the disease. When the larger young leaves are affected they often become curled and distorted, and the infected areas drop out or become cracked, so that the leaf is punctured with holes. Only young growing leaves and the young shoots apparently can be attacked by the fungus; leaves and shoots that have become hardened and matured are quite immune to the disease.

In addition to the leaves and the tender shoots, the flowers * and young fruits are very susceptible to attack, and on this account the disease causes a great loss of fruit. If the flowers are attacked, they fall from the tree without setting fruit. When young fruits are attacked, they show rough scabby appearance and become cracked and generally fall from the tree in two or three weeks.

After the fruits have become half grown, they seem to be immune to further attack. Full grown fruits, after having fallen to the ground, however, may be attacked through wounds, and the fungus in this way, probably causes a good deal of rotting of the fruit from the time of gathering until it reaches the factory.

TREATMENT OF THE DISEASE.

As this disease became epidemic last year, it is quite probable that under favourable conditions, it may do even more damage this year, and every one should be prepared to combat it. Fortunately, it is comparatively easy to treat. If possible, all the dead wood and diseased leaves should be collected and burned during the dry season and as soon as the trees begin to make their new growth after the rains begin, they should be thoroughly sprayed with Bordeaux mixture 4-4-50 to every gallon of which should be added a sticker made as follows :—

Resin	2 pounds
Washing soda (crystals) ...	1 pound
Water	1 gallon

Mix and boil until the preparation is a clear brown, about one hour. This will make the Bordeaux spread and stick to the glossy surface of the lime leaves. After the first application has been made, the trees should be watched very carefully as time goes on, to see whether or not the new growth is becoming infected. If infections are found, it would be advisable to make another application of Bordeaux Mixture. The number of applications necessary can only be judged according to the climatic conditions throughout the growing period.—Bull of Department of Agriculture. Trinidad and Tobago.

* This disease is for this reason also known as Blossom-blight.

TRACTOR NOTES.

THE WORKING OF A TRACTOR.

The difficulty in working a tractor is a decided disadvantage. It is considered most unwise for a man to gain the necessary experience by experimenting with his own machine. It is not sufficient for a man to understand the running of stationary engines or automobiles. The mere starting of the motor, changing of gears, and stopping are simple matters, and any farmer can learn quickly to do these, but the important thing is the ability to detect trouble the minute it begins to develop, and to be able to remedy it promptly instead of allowing it to run along until an expensive delay results. Some manufacturers in America train owners to operate their machines and the charge for instruction is credited as part payment of the machine. They also keep the tractor in repair free of charge during the first year's service.

The experience in America is that with reasonable care there is little if no expenses for repairs in the first year. In the second year comparatively few machines go through the working season without repair charges. During the third year the repair charges may increase to double the second year.

It is difficult to estimate the repairs for the entire working life, this will vary according to the number of days used annually as well as to the proficiency of the operator and to the care given to the outfit when in use and when idle.

From careful comparison of a large number of reports it is calculated that the annual charges on repair, works out to 4 per cent. of the initial cost of the outfit.

THE LIFE OF A TRACTOR.

For tractors of modern design there are really no definite figures. A tractor, it must be remembered, works under extremely severe conditions. The bumps and jars

due to rough and uneven ground and to obstructions, and the almost constant shower of dust and dirt it gets when working very soon attacks not only gears and bearing surfaces outside but also inside the engine itself. This wear due to dust is a most serious matter and purchasers should see whether a machine is provided with an efficient filter for the air intake to the carburetter. This is a very great improvement in modern machines.

With reasonable care, it is stated that a tractor should last for 9 years consisting of 50 working days a year (or 10 years of 45 working days for a 2-plough machine) i.e., 450 working days. It will be safer to estimate a less period of activity when purchasing a machine although the estimate given is a good average estimate. With inefficient handling a tractor may wear out in 6 years or less and perhaps after considerable repair charges.

THE ADVANTAGES OF A TRACTOR.

It would appear that in the purchase of a tractor there are three deciding factors :—

1. The amount and value of work a tractor can do annually.
2. The value of labour it can save and displace.
3. The amount of increase in return that may reasonably be expected.

When cultivating extensively whether it be coconuts, foodstuffs or other field crops it is sounder to produce more per unit of labour and capital than more per acre. In the former we should look to such implements as the tractor to save and displace labour.

THE DISADVANTAGES OF A TRACTOR.

Apart from the difficulty there is in efficiently operating a tractor, the greatest disadvantage which all tractor-owners in America report lies in its inability to do satisfacory work under moist soil conditions. This is especially marked in heavy soils. It is stated that the tractor cannot work well until the top soil is dry. In low spots and depressions where water tends to accumulate the ploughs pull hard and the soil packs to such an extent as to be injurious to crops.

It is a matter for experiment whether tractor-ploughing will be successful on the heavy laterite soils that pack and puddle badly and do not scour the plough well. It is necessary, however, to bear in mind that unsatisfactory ploughing work is not the fault of the tractor. The tractor's part is to furnish the power to pull the ploughs. The ploughs may need adjusting or may have to be designed so as to work in such laterite soils.
—*The Tropical Agriculturist.*

BOTANICAL NOTES.

SOME INTERESTING SPECIES OF PALMS.

Licuala grandis, from New Britain. This is a great favourite amongst the dwarf decorative palms and different altogether from the other species of Licuala of which there are several. A single slender stem 3 inches in diameter. A small compact head of about a dozen leaves, these $\frac{3}{4}$ circular, plicate, in plants about 3 feet high, 24 inches across and the edges cut much deeper, slightly cupped, the points cut $\frac{3}{4}$ inch deep, these again cut $\frac{1}{4}$ inch deep, the stalk slender with small recurved thorns, in plants twice the size the leaves are considerably larger, losing the cupped condition, and are either flat or somewhat drooped. Inflorescence among the lower leaves. Spadices compound, 3-4 feet long, pendant with short branches in groups 6 inches between them. Flowers small whitish. Fruit small bright-red.

Licualas generally.— These include *L. Rumphii*, *L. spinosa*, *L. elegans*, etc., all more or less alike in general appearance to a novice, but each with decided differences to one versed in palm lore. They are all soboliferous and form a plant almost, or quite as large in expanse as in height, some 10-12 feet, all very similar in foliage, nearly circular, differing slightly in the depth of the segments and the toothing of the points, also in the shape and size

of the thorns on the leaf-stalks. Again, in most, the spadices are mostly upright, half their length among the leaves and the upper half outside above. The branching of the spadices is in groups of simple branches and the fruit small and red. Most useful plants in a pleasure ground where there is plenty of space.

Licuala peltata is probably less known than the others and is less robust. The principal difference here is in the leaves, these are semi-circular, the segments cut to the base, except the centre which is double, and cut to 6 inches from the apex, the leaf-stalk running up to meet this.

Livistona. Here we have a section of the palm world containing several species which are most useful in planting up large areas in groups or single specimens, giving a decided change in the aspect combined with the many feather-leaved species, all of them being fan-leaved and large growing too. Most of them are also most useful as pot-plants for general decoration purposes, as it is possible to keep them fairly small for a long time, more particularly the two kinds known as *L. rotundifolia*, and *L. altissima*, two most deservedly popular species, in their young state not recognizable apart; with a compact small head of circular plicate leaves and thorny stalks well below the leaves. The typical form is that of the commonest species, *L. chinensis*, which 50 years or more ago was well known by the name of *Latania borbonica*, though it is difficult to understand how a Livistona could be arranged as a Latania, seeing that the former is a bisexual plant and the latter dioecious. Also it is similarly incomprehensible how *Livistona australis* could be included with the Coryphas as all these are monoecious. However such was the case but they have been straightened out and placed in their proper category. *L. chinensis* comes from South China, is a single stemmed plant,—in fact, all Livistonas are single stemmed, tall growing stem 9 inches in diameter with a large conspicuously rounded head of leaves, the leaf 5-6 feet across, not quite circular, drooping in the centre and at the sides, segments cut to about half down with drooping points. Broad masses of netted fibre cling to the stem. Leaf-stalks stout 3 feet

6 inches long, thorny. The inflorescence interfoliar; spadices 4 feet long with compound wiry branches set 6 inches apart, 12 inches long with as much spread. Flowers small, whitish; fruit olive shaped, green turning black on ripening $\frac{7}{8}$ to 1 inch by $\frac{5}{8}$ to $\frac{3}{4}$ inch wide. Wild animals are very fond of the green fruit when served to them in captivity.

L. olivaeformis from Java is verv similar to the above species and only a connoisseur would recognize the difference.

L. Hoogendorlifii, probably also from Java, is somewhat similar but ragged looking in its foliage, the leaves split up with the force of the wind, and the leaf-bases cling to the stem, which is not the case with the other two species.

L. rotundifolia from the Malay Islands and the Moluccas, and *L. altissima* from Java, are two very similar species. Both are tall growing, the stem of the first rather thicker than that of the second; the foliage is alike except that in the former it is quite circular and often overlaps, whilst in the latter the sides do not meet; the spadices are similar too though stronger in the first than in the last; the fruit of both is about $\frac{3}{4}$ inch in diameter, in the former cherry coloured and in the latter terra-cotta coloured. As before mentioned the young plants of these two species are the prettiest little palms imaginable, armed with sharp short thorns which disappear in the older plants.

L Jenkinsiana the "Toko Pat" from Assam and Sikkim. A handsome palm with a fairly stout stem to which the leaf-base clings for a long time. The foliage is the largest of that of all the Livistonas being 5 feet in diameter, quite circular, plicate, flat. with a straight fringe all round cut deeply. The leaf stalks are fairly strong, flat above, rounded beneath, with thorns on the lower half length. The spadices amongst the leaves, sturdy, compound, 2-3 feet long. The fruit $1\frac{1}{2}$ inches diameter, dark blue, pithy; the seeds about the size of ordinary marbles, brown.

L. australis the "Australian Cabbage palm," formerly known as *Corypha Australis*. A tall growing thick stemmed palm, closely scarred with the leaf bases, with a large head of fan-shaped leaves deeply cut and with a drooping fringe. Leaf stalk long and slender armed with short thorns. Spadices long and slender amongst the leaves, flowers small, whitish; fruit small and round, dark brown.

Bactris. This genus comprises several species, the greater number however belong to the section of which *B. major* is a type, growing in continuously spreading groups densely formed, with tall slender stems each with a head of few leaves, some erect, others with drooping foliage, a few forming handsome groups in contradistinction to the rigid forms. In the Botanic Gardens there are 5 or 6 species introduced from the interior by the late G. S. Jenman which as far as I know have not been determined; one, a handsome group growing in the South-west front border, which has interrupted foliage, the only one I know of this description.

B. simplicifrons from Brazil. This is the smallest growing Bactris known. Shade loving, growing in clumps 2-3 feet wide, stems like small canes only $\frac{1}{4}$ inch thick; the plant 6 feet high, the tops spreading nearly as much, 6 or 7 leaves to each stem, V shaped entire with numerous longitudinal ribs; centre rib 4-4$\frac{1}{2}$ inches long prominent, the two sides prolonged to 14–15 inches, 3 inches wide, terminating in an oblique point. The spadices below the leaves, very small, wiry, stalk 4-5 inches long, with 3-6 small wiry branches 3-4 inches long. Neither flowers or fruits have been noticed but they must of necessity be small. This is one of the prettiest of dwarf palms but rarely seen.

Bactris minor, commonly known as *Guilielma speciosa*, the "Peach palm," "Pirijao," "Parapee," "Parapiballi," "Paripou," "Peepumka," "Piritu palm," "Tobago cane," of South America. A tall growing palm with several stems 5-6 inches in diameter, rings very plain, broad, 3-4 inches apart, covered between the rings with

fine sharp black spines,, $\frac{1}{2}$–$1\frac{1}{2}$ inches long. Foliage 5-6-7 feet long, (very short stalk,) fairly graceful; leaflets on 4 planes in close groups, 15 inches long, $\frac{3}{4}$ inch wide. Spadices below the leaves, 2 feet long, (half stalk) crowded with short simple wiry branches a few inches long. Fruit conical 1-$1\frac{1}{4}$ inches diameter,, ripening a bright yellow. The seeds are black, $\frac{5}{8}$ inch long and $\frac{1}{2}$ inch wide; would make handsome Necklaces or Rosaries. The substance of the fruit is of a mealy character and edible, boiled in salted water it is fairly palatable.

Bactris Plumieriana, the "Prickly Pole" of Jamaica. This is the next largest in size of stem to *B. Minor.* A tall growing palm with several stems 5-6 inches in diameter, covered with close set rings of long sharp black thorns The foliage and leaflets similar to those of the preceding kind but much finer, the midrib thorny below. The spadices are also similar but smaller; a persistent thorny spathe arching over. The fruit is very small, red, probably the smallest of all the Bactris.

Bactris major may be taken as the type of a goodly number of West Indian and South American species called "Pimpler palms" or "Roseau," each one differing in the size, flexibility, drooping or erect position of the foliage, and form of fruit. All of them are smothered with sharp thorns from base to tip, and all growing in increasing masses by side shoots, the stems varying from an inch to 2 inches in diameter.

B. major has dark green rigid leaves 5-6 feet long, leaflets narrow, regular in 2 rows standing at a sharp angle. Spadices short with wiry branches, the spathe persistent above. Fruit elliptical $1\frac{1}{2}$ inches long, a little more than an inch in diameter.

Bactris tricospatha, is of interest as being an indigenous palm from which the Indian "Blow-pipes" are made. The stems are long, $1\frac{1}{2}$ inches at most in diameter, with whitish wings and whorls of viscious black spines, mixed, 1-3 inches long. Foliage 3 feet long with regular leaflets 8-10 inches long, 3 inches wide, with several longitudinal ribs. Spadices between the leaves

very small, with simple wiry branches, altogether 6-9 inches long, a persistent spathe above, all smothered with short black spines. Fruit, bright red, elliptical, $1\frac{1}{4}$ inches long, $\frac{3}{4}$ inch diameter.

Bactris flavispina. This is a species belonging to the same group, but of a more compact habit and much less spread. The principal difference in this to the others is that the spines are yellow instead of black. The foliage is some 6 feet long. The leaflets in groups of 2-4, 18 inches long, $1\frac{1}{2}$ inches wide.

Archontophœnix Cunninghamiana of New South Wales, better known as *Seaforthia elegans.* Single stem, closely ringed, 6 or 7 inches in diameter, tapering Leaves 8-10 feet long,—leafstalk only about 6 inches,—standing out rigidly, the lower ones horizontal, rounded in contour; leaflets regular in two rows fairly rigid, 18 inches long, narrow. Spadices below the leaves, white, $2\frac{1}{2}$-3 feet long, branching thrice. The smaller branches like thick twine 8-9 inches long. Flowers small, whitish, monoecious side by side. Fruit bright red, round, $\frac{3}{4}$ inch diameter.

Archontophœnix Alexandrae, from Queensland. A very rare species somewhat similar to the preceeding kind with longer and more flexible foliage and drooping leaflets, easily affected by the wind. The spadices are similar but the flowers mauve coloured and the fruits of a less bright red.

Serenoa sp. A grand palm, forming a large group of stems, furnished from base to summit with pretty Thrinax-like foliage, $2\frac{1}{2}$ feet across, thin, fan-shaped, segments cut down a few inches only. Inflorescence amongst the upper leaves. Spadices thin, 3 feet long, with few simple branches tiny whitish flowers and small round fruits.—J.F.W.

RACES OF THE COCO-NUT PALM.

In a special article contributed to the *Philippine Agricultural Review,* on the coco-nut, its culture and uses, Mr. P. J. Wester, Agricultural Adviser to the Philippine Agricultural Department, remarks that there is still much to learn about coco-nut varieties, as very little systematic study has been made of them. Existing litera-

ture seems to indicate that there are altogether not more than thirty-five distinct coco-nut varieties, a remarkably small number considering the antiquity of its cultivation and its wide distribution. The coco-nut is a plant that must be propagated from seed, and is very long-lived, therefore this constancy of characteristics is a distinct advantage to the cultivators of this tree. Were the coco-nut to be nearly as variable as most of the trees cultivated for the sake of their fruit in various parts of the world, the planting of coco-nuts would be a much more hazardous undertaking than it is now.

The different races seem to vary in the size of the nut, in the percentage of the copra obtainable from each nut, in the number of nuts produced, and in precocity.

Coco-nut plantations are chiefly cultivated for the production of copra, hence the tree bearing nuts with the largest percentage of this product are the most desirable for planting. In selecting a variety however, for the production of copra, the one with the largest nuts will not necessarily turn out the most profitable. The preferable variety is the one that produces the highest percentage per tree of copra. A variety bearing small nuts, but a large number of them, may thus be preferable to one that bears large but few nuts. A precocious variety is naturally to be preferred, other things being equal to one that is slow in coming into bearing.

In the *Garden's Bulletin*, Straits Settlements, September 12, 1919, there is a short note on the fourteen varieties of coco-nuts which are known to exist at Singapore island. There are also given capital illustrations of these fourteen varieties together with their native names.

From four of the commonest races in the island most of the Singapore copra is made; the nut of a fifth very common variety is too small for the commercial production of copra, but is sold cheaply in the local markets for ordinary domestic use. Other less widely spread races also yield good nuts for copra making.

The nuts of the others have special uses. One variety produces little detached granules of the nutty substance in the milk—not in every nut but in 4 or 5 per-

cent.—and these nuts are eaten with sugar as a delicacy. Still another variety has more sugar in the milk than most coco-nuts, and for that reason is also reserved for eating. One variety produces nuts which are reserved for making medicines, as the ' meat ' has a very pleasant scent.

Considering the increased attention that is being paid to coco-nut cultivation in the West Indian islands, it would appear to be of importance if careful investigation could be made with regard to the races of coco-nuts available for planting purposes in these islands. Although, as was pointed out above, the varieties yielding the largest percentage per tree of copra are the most desirable for planting on a large commercial scale, it would seem that for orchard purposes some of the other varieties recorded from Singapore might very profitably be also grown for local sale.

AMERICAN BOTANY.

The way in which the modern school of American botanists has been changing the old recognised names, not only of specific and generic, but even of the orders of plants, has been a source of puzzlement, not to say irritation, to men of an older school.

These feelings are rather amusingly expressed by W. F. Massey in a note published in the *Southern Planter*, November 1, 1919. Referring to a volume published by the Department of Agriculture, United States of America, on the flora of the district of Columbia, he says he finds that the nomenclature of the common native and introduced wild plants has been so entirely changed of late years by the modern American botanist that old fellows like himself are completely at sea.

Hair-splitting differences, he remarks, have been taken as reasons for upsetting, not only species and genera, but orders. No longer have we Legumnosæ; they are now Fabaceæ. Just why, no one but a Washington botanist could tell. The name Legumin osæ is surely more descriptive than Fabaceæ derived from the

name of a single genus. A legume or pod describes a great many genera, Faba does not. Just as well call them "Foolaceæ."

Botanical names have been latinized as a common language, so as to make the name the same in all modern languages. It is hardly possible that European botanists are going to follow a nomenclature heretofore unknown outside of Washington and the New York Botanical Garden.

PLANT DISEASES AND PESTS NOTES.

NIMBLES AND THEIR TREATMENT.

HOW TO TREAT INFESTED FOWL HOUSES.

Begin in the morning by removing all unnecessary material from the henhouse, including nests, roosts, superfluous boards, etc. If these are of no great value it is usually advisable to remove them carefully and place them on a bonfire. If it is desired to keep the boxes they should be placed in a pile ready for spraying. When either crude petroleum or carbolineum is used it is generally necessary to spray the entire inside of the chicken house. For this purpose it is best to use a good bucket pump with a 10 or 12 foot lead of hose and a good nozzle. It will be found that either the carbolineum or crude petroleum will spray better and go farther if thinned with about one part kerosine to two parts carbolineum or crude oil. The spray should be driven directly into every crack, and the roof well covered as well as the walls. Ordinarily it is also necessary to spray the floor, as some ticks are dropped in removing the roosts, etc. On heavily infested premises it is usual to find every small coop and brooder infested as well as the large chicken house, and if such is the case they should either be burned or be thoroughly sprayed.

In using carbolineum or anthracene oil in treating a poultry house which is closely built, it is advisable to keep the fowls out the night following the treatment in order to allow the material to dry in thoroughly, as the fumes from it are inclined to irritate the eyes and mucous membranes of the chickens. This precaution is not necessary in the usual open-front or loosely built chicken house. After spraying with crude oil it is usually advisable an hour or two after spraying to wipe the free oil off the roost poles and other parts of the building where it may have accumulated and be in danger of dripping on the chickens.

On many farms poultry roost to some extent in the trees, and the ticks are to be found in great numbers under loose bark and crevices in the trunks. Barns heavily infested with ticks are not uncommon. It is obvious that ordinarily trees and barns can not be sprayed effectively and these conditions must be met by making the chickens roost in the henhouse after it has been treated.

NUMBER OF TREATMENTS NECESSARY.

The number of treatments necessary is dependent largely upon the construction of the building, the number of infested places on the premises, and the thoroughness of the work. Following careful spraying, it is of paramount importance to build roosts and nests of the type described below, in order to destroy the infestation. If the chicken house can be sprayed thoroughly, usually one general treatment is sufficient with either of the materials mentioned. The crude oil is less persistent than the carbolineum, and unless nearly all of the ticks are reached, it is sometimes necessary to give a second or even third general spraying, when the crude oil is used. In any event it is important to keep a watch on the roosts, and usually advisable when carbolineum is used to treat them once with a brush about 30 days after the general spraying and give two or three treatments in the same way at 20 or 30 day intervals if crude oil is employed. Owing to the great longevity of the ticks and the possibility of some of them being picked up by chickens roosting or laying away from

the regular place, it is always advisable to keep watch for a year or two on the roosts and nests, and as soon as any ticks are observed to give the roosts and nests a treatment with a brush.

ROOST AND NEST CONSTRUCTION.

After the spraying has been completed it is of vital importance to have roosts and nests properly constructed. In some localities roosts suspended by wires from the ceiling of the henhouse have become quite generally used. While such roosts aid in preventing very heavy infestations, they are constructed in such a way as to make the destruction of ticks on them difficult, and some breeding usually takes place on the roosts themselves.

Since the natural tendency of the tick in all stages is to crawl upward, and not on the ground, it has been found that a *roost supported from the floor of the house and kept entirely free from the walls is by far the most satisfactory. It is also essential to have the roost fitted together in such a way that it can be examined or knocked down with greatest possible ease.* It consists essentially of four supporting posts either set in a concrete floor, sustained on a wooden floor by brackets, or driven into the ground in the case of a dirt floor. These four posts are made of two by fours or two by sixes according to the size of roost needed. The tops are notched to receive crosspieces of similar material. These crosspieces are in turn notched at intervals of about 14 inches to receive the roosting poles. The ends of the roosts and crosspieces should not extend near enough to the walls of the house to permit fowls roosting on them to touch the walls. The entire roost construction should be made of good lumber free from loose bark and with very few cracks, knots, etc. After constructing the roost it should be sprayed or given a good coat with a brush of the material used in spraying the chicken house.

The construction of nests so that they can be cleaned and treated with ease is nearly as important as having roosts so built. This is especially true during the hatching season. For small flocks it is possible to utilize boxes for nests and to burn them as soon as they become infested.

The essential features are to avoid complicated construction and to facilitate prompt and complete removal and treatment. A series of nests may consist of a bottom board resting on a stand or placed loose on iron brackets screwed to the wall. Upon this are set without attachment the nest partitions. These partitions are held together by a board 4 inches wide nailed along the front edge at the bottom to retain the nest material and another on the top of the front edge. The wall of the house forms the back of the series of nests or another board can be hooked to the partitions for this purpose. A piece of galvanized iron is fastened lightly to the wall with nails or wire to form a covering. This prevents chickens from roosting on the nests and gives some seclusion to the laying hens. for treatment the cover can be removed or fastened up, the nest partitions lifted off, the nest material burned, the bottom board removed, and the entire structure easily oiled with a spray pump or brush.

Methods of Preventing Tick Infestation.

It is much easier to exclude fowl ticks from clean premises than to destroy them after they are once established. For this reason those who contemplate beginning chicken raising should employ every means of maintaining tick-free premises. For the commercial poultry raiser it is advisable to choose a site well apart from other premises where chickens are raised, and in constructing a poultry house and arranging other equipment the question of controlling the fowl tick and other poultry pests should be kept constantly in mind. For such a beginner it is advisable to start with chickens hatched from incubators on the premises or to secure day-old chicks from hatcheries known to be free from ticks. Should it be deemed advisable to bring chickens onto a place at any time, they should be placed in temporary coops in small yards for 10 days. During this quarantine period the seed ticks, should there be any on the fowls, will have become engorged and left them. The chickens then may be treated with sodium fluorid for lice and liberated. The quarantine coops should then be burned or sprayed with carbolineum or crude oil as outlined above. The same procedure should

be followed in moving fowls from an old, infested coop into a clean one.—Farmers Bulletin, U.S. Department of Agriculture.

ORIGIN OF CERTAIN SKIN IRRITATIONS.

Not infrequently, on donning underclothing or other apparel which has just been returned from the wash, intense and painful irritations set up. Recently the origin, or perhaps the probable origin, has been traced to the fact that in British Guiana laundry is not infrequently *spread out to dry on bushes or shrubs growing in the yards* of the local washerwomen. Now the castor oil plant is a by no means uncommon plant in such localities and a common pest of this particular vegetation is the larva of *Sibine fusca* Stoll. The name of course is unfamiliar to laymen but the appearance of the worm to many people is a matter of everyday experience. Slug-like in shape and actions, brilliant apple-green in colour and armed with short rosettes of what, on closer examination, prove to be ugly looking spines, these caterpillars in contact with the skin cause a fierce irritation. These creatures' manufacture their cocoons in situ on the castor oil plants; the cocoons are heavily impregnated with the spines from the cast skins of the caterpillars.

It stands to reason, therefore, that clothing spread out on such infested bush must also become infested with spines and by this means they eventually come into contact with the skin when the clothes are worn.

A PECULIAR HABIT OF THE RED ANT.

In this colony the term 'red ant' is invariably applied to that species which is known to science as *Solenopsis pylades* Forel. It is a common coastland species, and its grass-grown nest mounds rising to as much as two feet are conspicuous objects in most pastures. The species is also a pest for it has developed the objectionable habit of hollowing out the stems of rice plants; it also fosters quite a number of scale insects and is altogether obnoxious.

During heavy rainy weather its nests are completely inundated and were it not for the habit which is about to be described annihilation of the various colonies would take place.

It appears that as soon as the nest becomes swamped the entire colony swarm out and, clinging to one another tenaciously, form a floating raft composed of the bodies of thousands of ants. These rafts float about on the surface of the water a prey to the force of the prevailing wind; eventually they come in contact with terra firma once more when they disperse. A mass of these ants has been observed to float in this manner for close on three days.

THE DEPTH TO PLANT BANANAS.

With a view to determing the depth at which bananas should be planted for best results, an experiment was arranged at Wollengbar Experiment Farm, sets being put out in March, 1917, at 6, 9, 12, 15, 18, and 21 inches deep. So far no fruit has been harvested from the plots, none having matured; but the best stool at present is from the plant set 15 inches deep, it having five stems and two suckers. The next best stool is that planted 12 inches deep; it has four stems and four small suckers. The plant put in 9 inches deep has three stems and three suckers. The stools put at 18 inches and 21 inches have only two stems and one sucker each, while the set put in 6 inches deep died at the start. The test will not be conclusive until the plants mature fruit, but in the meantime the results afford some indication of the best depth.—Agric. Gazette: N. S. W., Vol. XXX. Part 8.

ATTENDANCES AT THE DISTRICT GARDENS

Year.	Bourda.	Belfield, E. Coast.	Stanleytown, New Amsterdam.	Suddie, Essequibo.	Den Amstel.	Houston, E. Bank.	Wakenaam.	Total Attendances.
1912 ...	5,514	4,395	3,302	2,100	2,544	2,156	718	21,729
1913 ...	5,156	4,535	2,519	3,399	2,568	1,836	1,319	21,332
1914 ...	4,243	3,869	2,443	3,025	1,791	1,653	1,533	18,577
1915 ...	1,123	1,006	769	59	503	339	401	4,200
1916 ...	4,705	1,161	1,510	225	623	2,251	1,297	12,026
1917 ...	4,991	2,820	1,366	3,297	1,186	2,564	1,663	17,886
1918	4,834	3,081	1,653	2,671	2,162	2,790	2,067	19,258
1919								
1st Quarter	965	626	256	749	450	639	515	4,200
2nd Quarter	1,174	650	721	766	427	614	343	4,695
3rd Quarter	1,043	424	343	489	379	517	200	3,395
4th Quarter	1,587	725	262	794	595	710	498	5,171

EXPORTS OF AGRICULTURAL AND FOREST PRODUCTS.

Below will be found a list of the Agricultural and Forest Products of the Colony exported during the year 1919. The corresponding figures for the two previous and the average for the four years previous to that are added for convenience of comparison.

Product.	*Average 1913-16.*	*1917.*	*1918.*	*1919*
Sugar, tons ...	103,105	114,006	93,901	83,139
Rum, gallons	3,958,949	3,415,921	2,614,481	4,342,769
Molasses, gallons	50,474	149,940	208,262	171,249
Cattle-food, tons	3,128	2,424	2,754	2,023
Cacao, cwts. ...	474	71	85	85
Citrate of Lime, cwts.	192	155	31	388
Lime Juice, gals.	No records	17,287	13,846	10,238
Essential Oil of Limes, gals.	No records	251	180	326
Coconuts, thousands	1,621	1,911	1,516	4,693
Copra, cwts. ..	1,638	1,507	2,487	1,367
Coffee, cwts. ...	2,223	2,347	4,751	8,362
Kola-nuts, cwts. ...	1,390	34	24	None
Rice, tons ...	9,216	14,367	8,017	6,942
Ricemeal, tons ...	652	140	81	None
Cattle, head ...	854	872	332	4
Hides, No. ...	4,780	1,549	3,291	7,562
Pigs, No. ...	1,315	455	None	None
Sheep, head ...	65	18	10	None
Balata, cwts. ...	11,951	14,249	10,185	12,546
Charcoal, bags ...	60,430	44,986	41,310	41,380
Firewood, Wallaba, etc., tons ...	9,536	7,307	7,260	6,846
Gums, lbs. ...	1,060	112	60	2,338
Lumber, cub. ft. ...	339,621	191,091	116,771	234,882
Railway sleepers, No.	7,432	30,633	7,743	5,458
Rubber, cwts. ...	50	132	214	158
Shingles, thousands	2,255	3,208	2,842	3,277
Timber, cub. ft. ...	225,443	51,769	31,082	101,383
Coconut Oil, gals....	No records	26,674	30,652	9,129

Meteriological Data—1919.

BOTANIC GARDENS, GEORGETOWN.

Months.	Rain-fall. Inches.	NUMBER OF DAYS OF RAIN Under .10 Inches	·10 to ·50 Inches	·50 to 1.00 Inches	1.00 to 2.00 Inches	Above 2.00 Inches	Total days	Evaporation Inches
January ...	4.60	3	11	.	1	.	15	4.82
February ...	.45	6	1	.	.	.	7	5.19
March ...	9.11	6	7	3	2	1	19	5.10
April ...	10.76	2	15	5	3	.	25	4.19
May ...	23.38	4	9	1	6	4	24	3.35
June ...	7.11	6	15	4	.	.	25	4.35
July ...	7.71	7	9	4	1	.	21	4 65
August ...	5.57	5	8		1	.	16	4.85
September ...	1.53	6	2	1	.	.	9	5.93
October ...	.78	3	.	1	.	.	4	6.30
November ..	4.60	2	6	2	1	.	11	4.70
December ...	8.56	3	12	3	1	.	19	3.86
Totals and Means.	84.16	53	95	26	16	5	195	57.29

The rainfall in 1919 varied from the normal * in the following respects : -An abnormally dry January and February were fol owed by an unusually wet March and April. The precipitation in May was among the highest ever recorded ; the months of June and July were accordingly drier than usual. August and September were normal. October was unusually dry. The other two months of the year agreed well with past records.

*The rainfall, temperature and humidity figures which we have taken to constitute a normal year will be found in the report on Meteorology for the calendar year 1916, which is included in the 1916 Annual Report of the Department of Science and Agriculture, British Guiana. They are the averages of the rainfall, etc., records for the period 1846-1916.

Below is a table showing the day of the year 1919 during which the greatest precipitation of rain took place and the amount thereof, also the day on which the highest shade temperature was recorded. These figures refer to Georgetown (Botanic Gardens), New Amsterdam (Botanic Gardens) and Onderneeming Industrial School). No temperature records were kept at Morawhanna (Police Compound) North West District.

Stations.	Wettest Day.	Rainfall	Hottest day.	Temperature.
Georgetown .	9th May.	4·91 inches	7th Oct	90·0
New Amsterdam	10th „	3·65 „	27, 28, & 30 Aug.	99·0
Onderneeming...	3rd „	5·15 „	27th Aug. 6th, 28th & 29th Sep. & 5, 6, 9 & 13 Oct.	92·0
Morawhanna ...	16th Dec.	4·59 „	No records	kept.

Air Temperature and Humidity in the Shade 1919. Botanic Gardens, Georgetown.

	Air Temperature.			Humidity.
	Maximum.	Minimum.	Mean.	Mean.
January ...	83·6	74·9	79·2	81·4
February ...	84·5	75·9	80·2	76·1
March ..	84·5	76·0	80·2	78·9
April ..	84·3	76·1	80·2	81·7
May	84·0	76·0	80·0	85·1
June ...	85·0	75·5	80·2	80·1
July	85·2	75·3	80·2	78·4
August ...	86·2	75·3	80·7	81·4
September ..	87·7	76·0	81·8	77·5
October ...	87·9	75·7	81·8	75·9
November ...	86·8	75·8	81·3	78·2
December ...	85·0	75·1	80·0	82·0
	85·4	75·6	80·5	79·7

By comparison with the figures for a normal year the maximum air temperature in the shade agreed fairly well with the exception that the temperature during October and November was abnormally high.

The minimum air temperature in the shade was somewhat higher than the normal. The humidity was greatest in May and least in October.